Generation Interconnections

This analysis was completed to assess the reliability impact for a new generator interconnecting to the PJM system as a capacity resource.

Network Impacts - 650 MW Injection

Three alternatives were investigated:
1. Injection of 650 MW into the Colora Tap of the Conowingo - Nottingham 230kV line. (note: Generator Interconnection Request Queue #29 400 MW injection also is into the Colora Tap of the Conowingo - Nottingham 230kV line)
2. Injection of 650 MW into the Peach Bottom - Keeney 500kV line.
3. Injection of 650 MW into the Peach Bottom - Keeney 500kV line and changing the attachment of Generator Interconnection Request Queue #29 400 MW to also be an injection into the Peach Bottom - Keeney 500kV line.

Alternative 1

The results of a screening analysis show that injecting an additional 650 MW into the Colora Tap of the Conowingo - Nottingham 230kV line causes a large number of overloads on the transmission system. While numerous single-contingencies may cause overloads on a given line or transformer, only the most severe overload for each line or transformer is detailed below.

· There is a normal overload on the Colora Tap-Nottingham 230 kV line section of 133% of emergency rating. Loss of the Conowingo-Bradford 230 kV line increases this overload to 181% of emergency rating.

· There is a normal overload on the New Generator's substation-Colora Tap 230 kV line section of 140% of emergency rating. Loss of the New Generator's substation -Colora 230 kV line increases this overload to 195% of emergency rating.

· Loss of the Conowingo-Nottingham 230 kV line overloads the following:

Glasgow-Cecil 138 kV line to 337% of its emergency rating.
Cecil 230/138 kV transformer to 222% of its emergency rating.
Colora #1 230/35 kV transformer to 211% of its emergency rating.
New Generator's substation-Colora 230 kV line to 192% of its emergency rating.
Glasgow-Keeney 138 kV line to 180% of its emergency rating.
Colora #2 230/35 kV transformer to 174% of its emergency rating.
Cecil-Colora 230 kV line to 109% of its emergency rating.
Clay Tap-Colora Tap 230 kV line section to 104% of its emergency rating.

· Loss of the Conastone-Peach Bottom 500 kV line overloads the Graceton-Nottingham 230 kV line to 117% of its emergency rating.

Although not solely responsible for the overloads, Alternative 1 will also contribute to many normal or contingency overloads of the PECO Energy 230 kV facilities identified as overloaded in the Network Impacts for Generator Interconnection Request Queue #A27 Passyunk 725 listed on the PJM website.

A short circuit screening was performed. Analysis indicates that the Colora 230 kV circuit breaker #745 may be overdutied. In addition, this alternative will contribute to short circuit overduty to many of the twenty eight 230 kV PECO Energy system breakers identified in the Network Impacts for Generator Interconnection Request Queue #A27 Passyunk 725 listed on the PJM website.

The screening analysis results suggested that alternative 1 should be excluded from further consideration at this time.

Alternative 2

Load flow analysis was performed for normal conditions, single contingency outages, and towerline outages. No network overloads were solely attributable to injection of 650 MW into the Peach Bottom - Keeney 500kV line. However, Alternative 2 does contribute to contingency overloading which will exist if projects with a lower position in Queue A are developed. The overloaded facilities and contribution from this generator are as follows:

· 20 MVA contribution to the overload of the Brunner - West Hempfield 230 kV circuit for the outage of the Conastone - Peach Bottom 500 kV circuit.
· 40 MVA contribution to the overload of a Conastone 500-230 kV transformer for the outage of a parallel Conastone 500-230 kV transformer.

Contingency loading on the Brunner - West Hempfield 230 kV circuit is close to it's existing limit at present. The addition of several new generation projects, including Alternative 2, being evaluated in Generator Interconnection Request Queue A will adversely affect loading on this circuit to the extent that overloading will occur. Due to the existing number of generation interconnection requests that impact this circuit, it is not reasonable at this time to completely develop what, if any, network upgrades will be required. One possible solution that will be evaluated is the addition of a new 230 kV transmission line from Brunner to South Akron, which alleviates some existing network problems and will provide capability to relieve the overload listed above. The line will cost approximately $52 million and take approximately six years to build. However, there may be other solutions. The Brunner area will be studied more extensively during the next level of analysis. Transmission upgrade requirements and associated costs, if any, will be specified at that time.

The contingency overload of one Conastone 500/230 kV transformer for the loss of the other requires the installation of a third Conastone 500/230 kV transformer. Installation of the new Conastone transformer is estimated to cost $20 million and take approximately

three years to install. Installation of the third transformer requires a new two breaker 230 kV bay, approximately 2500 ft. of 230 kV aluminum tubing, a 1500 ft. 500 kV tap and a 500 kV breaker.

A short circuit screening was performed. Results indicate that 500 kV circuit breakers #55 and #65 at Peach Bottom become overdutied as a result of Alternative 2. In addition, Alternative 2 will contribute to fault interrupting requirements for seven other 500 kV circuit breakers which become overdutied as a result of earlier generation projects in Generator Interconnection Request Queue A. The estimated cost to replace nine 500 kV circuit breakers is $3.2M and will require an 18 to 24 month leadtime.

Alternative 3

Load flow analysis was performed for normal conditions, single contingency, and towerline outages for the injection of 1050 MW into the Peach Bottom - Keeney 500kV line. Results indicate that there are no network overloads which were solely attributable to Alternative 3. However, Alternative 3 contributes to contingency overloading which will exist if projects with a lower position in Generator Interconnection Request Queue A are developed. The overloaded facilities and contribution from Alternative 3 are as follows:

· Contributes 30 MVA to the overload of Brunner - West Hempfield 230 kV circuit for the outage of the Conastone - Peach Bottom 500 kV circuit.
· Contributes 70 MVA to the overload of Conastone 500-230 kV transformer for the outage of a parallel Conastone 500-230 kV transformer.

Upgrades for the above two contingency overloads are the same as Alternative 2.

A short circuit screening was performed for the injection of 1050 MW into the Peach Bottom - Keeney 500 kV line. Results indicate that 500 kV circuit breakers #55, #65, and #225 at Peach Bottom become overdutied. In addition, this project will contribute to fault interrupting requirements for seven other 500 kV circuit breakers which become overdutied as a result of earlier generation projects in Generator Interconnection Request Queue A. The estimated cost to replace ten 500 kV circuit breakers is $3.6M and will take 18 to 24 months to complete.